PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Stephen V.R. Hellriegel et al.
Application No.	:	10/012,210
Filed	:	November 5, 2001
For	:	ELECTRICAL CONNECTOR WITH STRAIN RELIEF STRUCTURE

Examiner	:	Tuan T. Dinh
Art Unit	:	2841
Docket No.	:	901115.435
Date	:	May 18, 2007

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S REPLY BRIEF 37 C.F.R. 1.192

Commissioner for Patents:

This reply brief is in furtherance of the Notice of Appeal, filed in this case on April 12, 2005 and in response to Examiner's Answer dated March 20, 2007. Applicants hereby request any fees necessary for acceptance of this Reply Brief be charged to Deposit Account No. 19-1090.

I. Rejections under 35 U.S.C. § 112

In the Examiner's Answer of December 23, 2005, the Examiner is silent with respect to the applicants' arguments regarding rejections under 35 U.S.C. § 112. Applicants presume that this indicates that the Examiner does not intend to maintain these rejections.

II. Reply to Examiner's Arguments

Applicants wish to briefly focus on three statements by the Examiner with which there is strong disagreement. Referring first to the last paragraph of page 8, the Examiner states

that "according to the specification on page 6, lines 21-22, the applicant is defined '**a strain relief structure**' being defined as '**an aperture that extended through the substrate**' [*sic*]." The Examiner then argues:

> So, there are plated through holes (PTH-10), in the Markovick reference take positioned between each of the carrieer's pads (12), **the PTH (10) is an aperture extended through the carrier (14), see figures 4-5**, hence, the PTH (10) acts as function and having structure as a strain relief structure, see figures 2-5. Further in column 3, lines 9-41, Markovick actually says that this reduces strain compare to conventional usage as a hole whether it is more strain they do hole it does not matter [*sic*].

(Emphasis in original.)

As best understood by the applicants, the Examiner argues that *strain relief structure* is defined as an aperture, and thus any aperture shown in the prior art anticipates the strain relief structure of the claim. However, contrary to the Examiners statement, *strain relief structure* is not defined in the cited passage. Instead, an example of such a structure is provided. The passage states that, "[a]ccording to a preferred embodiment, the strain relief structures 52 are apertures that extend completely through the flexible substrate material." The specification proceeds to provide further explanation of how such structures function, and how different configurations provide different results (see, for example, Figure 9 and the accompanying text at page 8, lines 14-19; page 9, lines 16-29, and pages 10 and 11 and the referenced figures). Much of this material is reviewed in the Appeal Brief filed October 6, 2005 (see, in particular, pages 7-10).

The fact that a strain relief structure may be in the form of an aperture is not the same as saying that any aperture will function as a strain relief structure. In particular, the plated through-holes cited by the Examiner are actually strain *causing* structures, and do not, themselves, relieve strain: "the deformation takes primarily place at the location of the plated through-hole (PTH) 10 and extend radially therefrom" (*Markovich*, column 5, lines 3-5). Nothing in the passage of Markovich cited by the Examiner suggests that the plated through-holes are strain relief structures. Instead, the passage teaches that, by spacing the holes equidistant from the BGA pads, the strain caused by the holes is minimized. Markovich states, at column 3, lines 3-14, that "[t]he equidistant positioning of the plated through-holes relative to the BGA pads … has evidenced a significant … reduction of stresses and strains generated

caused by the differentials in the coefficients or extent of thermal expansion between the plated through-holes and the organic chip carrier material supporting the BGA pads." Markovich further lists as an object, at column 3, lines 35-41, a method of positioning the plated through-holes, with the benefit of "a reduction in thermal deformation *caused by a mismatch* in the coefficient or extent of thermal expansion *between the plated through-holes and the organic chip carrier material*" (emphasis added). Clearly, Markivich's plated through-holes do not anticipate the strain relief structure of claim 1.

The second statement is on page 8, in the third paragraph. The Examiner states that "the organic carrier (14), prior to being thermally deform, is inherently flexible to some degrees. Since the applicant does not specify how flexibly of the substrate, therefore, the carrier meets the claim, so that the carrier being flexible and deformation during a solder reflow [sic]."

Applicants understand that the Examiner argues that Markovich's chip carrier is inherently flexible, and that because the claims do not specify a degree of flexibility, the limitation is anticipated by Markovich's carrier. The Examiner offers the thermal deformation of the chip carrier as evidence of flexing. Webster defines *flexible*, in relevant part, as "capable of being flexed : capable of being turned, bowed, or twisted without breaking : pliable," and defines *flex* as, "to bend esp. repeatedly so as to form folds in." *Webster's Third New International Dictionary*, 869 (1966), attached hereto as Exhibit A. Contrary to the Examiner's position, Markovich's chip carrier does not flex, i.e., bend, during reflow, but rather swells due to thermal expansion, then returns to its original thickness when it cools (see Markovich, column 5, lines 1-3).

The Examiner has construed the term *flexible* overbroadly in stating that organic carriers are inherently flexible. The "PTO applies to verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage *as they would be understood by one of ordinary skill in the art*." *In re Morris,* 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997) (emphasis added). If the Examiner's construction is correct, one of ordinary skill must consider the term *flexible* to be redundant when applied to organic laminate chip carriers, since, if such carriers are inherently flexible, the term does not add information.

The question of whether one of ordinary skill in the art would consider organic laminate carriers to be inherently flexible can be easily resolved by looking to the Furnival

reference (U.S. 3,977,074), cited by the Examiner in the present case. Furnival states, "FIG. 1 shows a printed circuit substrate 10 preferably of the *rigid* variety and utilizing *any conventional circuit board material*," and later states, "the conductors 30 on the opposite side of the substrate are preformed on a separate *flexible* substrate" (see column 1, lines 1-3, 52, and 53; emphasis added).

Furnival clearly does not consider conventional circuit board material to be inherently flexible, inasmuch as it distinguishes between flexible and rigid types in the specification, and considers them to be different from each other. While Furnival does not mention organic laminate specifically, it is well known in the art that organic laminate material is perhaps the most common class of substrate material available for chip carriers and circuit boards, and thus falls within the category of *conventional circuit board material*. The Examiner cites Markovich in view of Furnival in rejecting claims 3 and 5, and thus clearly considers the two references to be from the same field of art. Accordingly, absent other references to the contrary, teachings of either reference represent the understanding of one of ordinary skill in that field. To one of ordinary skill in the field of art to which both references belong, the term *flexible* clearly has a specific meaning when applied to substrates of the types under discussion, and is not regarded as inherent.

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the alleged inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy,* 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." *In re Rijckaert,* 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). See MPEP § 2112 at IV. The Examiner's arguments do not meet the standard necessary to show inherency of the flexibility limitation.

Applicants note that each independent claim in the present application recites a flexible substrate. Markovich does not teach a flexible substrate, either explicitly or inherently, and the Examiner has not suggested that the flexible substrate mentioned in Furnival anticipates the flexible substrate of the pending claims. On this basis alone, each of the claims is allowable.

Referring, finally, to the Examiner's statement on page 9 in subpart (II), the Examiner disagrees with applicants' argument that Markovich does not teach or suggest a thinned region as a strain relief structure, stating that, "the applicant does not specific disclose (first) the size of the strain relief structure, and (second) how much thin it can be made [*sic*]." The Examiner argues that Markovich discloses a chip carrier "having the PTH (10) formed in a thinned region *after* the carrier being reflow [*sic*]" (emphasis added). It appears that the Examiner is fundamentally confused about Markovich's structure and manufacturing process, since the PTH is formed *before* the reflow that results in the region pointed to by the Examiner as being a thinned region.

To clarify: first, a substrate is provided with plated through-holes, as shown in Markovich's Figure 4a. This is a hole drilled in the laminate that is then plated internally with metal to provide a conductive path through the hole, forming a metal tube in the hole. A chip is then positioned on the top, with solder balls that were previously formed on the bottom of the chip being placed in contact with pads 12 on the carrier. The reflow step is one in which the carrier is heated to a temperature sufficient to cause the solder balls to re-melt and flow out to adhere between the carrier and the chip, forming the necessary mechanical and electrical connections. This is the "reflow" step referred to. During this step, the laminate carrier and the metal plating expands due to the heat of the reflow step. Because the laminate has a higher coefficient of thermal expansion, it expands more than the metal tube of the PTH. This results in a distortion of the surface of the laminate, as shown in Figure 4b. The surface of the laminate close to the plated through-hole is held at the original thickness by the PTH, while most of the laminate expands, resulting in the funnel shape shown in Figures 4b and 5b. Any surface plating that is near this distortion, e.g., the contact indicated at 20 in Figure 5b, is in danger of delaminating, or peeling up. However, once the laminate cools, it returns to its original thickness, and the distortion disappears. Thus, the area cited by the Examiner as anticipating the thinned region of claim 4 is actually at approximately the original thickness, while the rest of the carrier is temporarily thicker.

Much of this process is not explained in detail in Markovich, inasmuch as it is very well known in the industry, and would be self evident to one of ordinary skill.

The Examiner appears to have suggested that the plated through-holes are formed after the reflow step, in the thinned region formed by the reflow. This is in fact impossible, since the problem that Markovich addresses is the distortion caused by the plated through-holes during reflow. Without the holes, there is no distortion, and no problem to resolve.

III. SUMMARY

Applicant requests that the Examiner's rejection be reversed and that the claims be allowed for the reasons stated herein and in the Appeal Brief filed in on January 19, 2007.

Respectfully submitted,
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Attachments:
Exhibit A - *Webster's Third New International Dictionary*, 869 (1966)

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